

development of open spaces. Of course, we have this bugbear of finance. I am quite sure Apollyon was never such an oppressor to Christian as finance is to a local authority.

As I have to do with several other spheres of local government work, I am not ignorant of the necessity of balancing the claims of one section with another; but the burden of my address in this matter is this: You can get 20s. out of your 20s., or in some cases you only get 5s., or you can get 20s. out of 10s. expenditure, and it largely depends on the way you go about your job and the amount of forethought that is put into it. At present we have to economise; that is why we have to make a penny go as far as possible.

Dealing with the suggestion which Councillor Steen made, I am after something more than a five years' programme. The time is overdue when every public authority ought to have a considered plan decided on after consulting all the interests, forecasting, as far as they possibly can, future requirements. (Hear, hear.) That is not a plan which is going to stand for ever: you ought to revise it in the light of prevailing conditions every five years or so, but I have no hesitation in saying that without that plan in public services you will be throwing away money; but with that plan you can make every penny of expenditure do double duty. Even more important to-day than money in the work of local government, and of central also, is forethought and action based on it. (Cheers.)

THE CHAIRMAN: This meeting will desire to pass a unanimous vote of thanks, I know. One of the most important points raised was the indication of possible co-ordination between the London County Council and the local councils. We have also had an interesting discussion on the question of mechanical appliances. I know Ministers and Civil Servants always speak the same; but I stand with the lady from Northumberland, and I am glad to see sandpits, swings and paddling pools as we see them in London. (Hear, hear.)

(The vote of thanks was carried unanimously.)

MR. GIBBON: There was one question I did not answer: Do I think that, in order to avoid the spreading all over the country of small houses, it is advisable to encourage groups of flats with communal gardens? This point about building all over the country is greatly overdone. There is plenty of land outside London that is not likely to be built on, not only in our time but for many generations. The real problem is to control building so as to obtain advantageous, instead of sporadic, grouping.

(SIR FREDERICK WILLIS proposed a vote of thanks to the Chairman: carried unanimously.)

(The meeting then terminated.)

PUBLIC HEALTH CONGRESS (1930).

WEDNESDAY, NOVEMBER 19th
(AFTERNOON SESSION).

CHAIRMAN: SIR ARTHUR ROBINSON, G.C.B., C.B.E.
(Permanent Secretary of the Ministry of Health).

Maternal Mortality and Morbidity.

AN ADDRESS BY

Professor EDWARD MELLANBY, M.A., M.D., F.R.C.P.,
F.R.S. (University of Sheffield).

EVERYONE interested in matters of public health has been stirred during the past few years by the knowledge that death of the mother during or after childbirth is a common calamity and that, in spite of all the advances of medical knowledge, the death rate does not diminish. The facts are known to all and I shall not spend much time with statistical data. Recently a Government Committee has reviewed the situation and, although little has been added thereby to our general knowledge on the subject, it has stated the facts clearly and indicated the difficulties of the problem.

The total maternal mortality from 1911 to 1929 per 1,000 births is given by the Registrar General as follows:

Year	Infantile Mortality Rate.	Total Maternal Mortality.
1911-15	109	5.02
1916-20	91	5.80
1921	81	5.0
1922	75	5.16
1923	69	4.82
1924	74	5.06
1925	75	5.15
1926	70	5.14
1927	70	5.43
1928	65	5.62
1929	74	5.82

In these figures the fall in the infantile mortality stands out in contrast with the stationary and even increasing maternal mortality.

If we now analyse the case of death of these women we find that in 1928 it was as follows:—

CAUSES OF DEATH AS RECORDED BY REGISTRAR GENERAL IN 1928.

	Per cent.
Abortion	2.60
Ectopic gestation	2.90
Other accidents of pregnancy	3.60
Puerperal haemorrhage	11.30
Other accidents of childbirth	11.30
Puerperal sepsis	40.50
Puerperal phlegmasia alba dolens not returned as septic	1.00
Puerperal embolism and sudden death	6.40
Puerperal albuminuria and convulsions	19.00
Childbirth not assignable to other headings	0.72
Puerperal diseases of breast	0.27

It will be seen that the two main causes of death resulting from childbirth are sepsis and eclampsia, the two together being responsible for nearly 60 per cent. of the total. What makes these figures so galling is that sepsis accounts for 40.5 per cent., for if ever there was a branch of knowledge which medical science has claimed to have advanced, and with good reason, it is the control of sepsis. Yet, here we have a condition in which sepsis flourishes in spite of all endeavour. As regards eclampsia, all medical men feel much more modest, and it will be generally agreed that at the present time we have but little knowledge of its aetiology.

The general problem with which we have to deal to-day may be viewed from two main standpoints: (1) the patient herself, and (2) the environment of the patient as she is affected by doctors, midwives, antenatal clinics or lack of any or all these adjuncts. With regard to the patient herself we must ask ourselves: (1) Why is she subject to puerperal haemorrhage?; (2) Is she more susceptible to infection at these times, and, if so, why?; (3) What is the cause of eclampsia? As to the external influences brought to bear on the patient in childbirth, we want to know whether defective skill and knowledge of the doctors and midwives is the crux of the problem as some think, also, whether antenatal treatment is as good as it should be.

I admit at once that I am incompetent to discuss the second series of problems, namely, the relative importance of the skill of doctors and midwives and the part played by antenatal clinics in fighting this dreadful scourge. I must leave this part of the subject to others. Incidentally, I might point out that it is on these particular problems that the Maternal Mortality and Morbidity Committee has concentrated almost all its attention. You may remember that the Maternal Mortality Committee made a close study of 2,000 cases of death in childbirth and the puerperium and came to the conclusion that about 50 per cent. of these cases could be accounted for by what they call a primary avoidable factor. This primary avoidable factor was in turn divided up in the following

way: 17 per cent. of deaths were said to be due to the absence of antenatal care; 17 per cent. to errors of judgment in practice or treatment by doctors and midwives; 5 per cent. to lack of reasonable facilities available or lack of medical care; 9 per cent. as due to the negligence of the patient or her friends in carrying out medical advice. Personally, however, I am impressed with the fact that in spite of the improvement in the training of midwives during the past twenty years, and the establishment of antenatal clinics during the past ten years, maternal mortality remains as high as ever. We must therefore conclude either that the introduction of this new skill is bringing in its train harmful influences which counterbalance its beneficial effects, or that neither doctors nor midwives nor any others know all of the significant facts about antenatal care and the welfare of the mother.

It was because of the conviction that some of the main points of maternal care were unknown that I decided to investigate the problem from a new angle, which, in a few words, may be described as that of the maternal organism itself. This I was able to do through the help of the Medical Research Council. I was provided with the assistance of Dr. H. N. Green, who is really responsible for the actual carrying out of most of the work to be described.

So far as the problem of access of pathogenic organisms to the maternal tissues is concerned, it seemed to us unlikely that we could add anything of interest or importance. This aspect of the problem has been investigated from every conceivable angle. We know with some accuracy the distribution of bacteria usually present in the genital organs of pregnant women; the action of antiseptics has been studied from all sides; indeed, childbirth has come to be treated with the same care as a surgical operation. In spite of all this knowledge, it is said that 12 per cent. of hospital cases of parturition develop a condition of morbidity as defined by the British Medical Association.

Again and again sepsis develops after normal childbirth in which there has been no interference and no mechanical difficulty to be overcome. It seemed to us, therefore, that we must believe that the natural resistance to infection of women at this time is very low, and it was to determine the cause of this diminished resistance, rather than the increased opportunity for infection, that required investigation. I hope that, from what I am going to say, the assumption will not be made that I consider the whole problem of access of pathogenic organisms to be of small account. Not for a moment do I think this to be true, and, whatever may develop from my remarks to-day, the prevention of bacterial contamination must always remain of great importance.

For many years I have been interested in the effects of diet in raising and lowering the resistance of animals to infection. Others working on nutritional problems have noticed this relationship, but it is only in the past two years that the subject has been sufficiently crystallised to allow direct and careful study. As so often happens in medical science, our knowledge has resulted from observations made on animals. Without describing the development of our present knowledge on the subject of resistance to infection, it may be said that if young

animals, for example, young rats, are placed on diets deficient in vitamin A, they die of sepsis. The pyogenic lesions are usually multiple and widespread, but begin in general in epithelial tissues. Thus we find infections in the middle ear, mastoids, nasal sinuses, genito-urinary tract, lungs in the form of broncho-pneumonia, and alimentary canal. Not only have the infective processes their origin in epithelial tissues, but the septic condition is either preceded or accompanied by hyperplasia, metaplasia or keratinisation of the epithelium. The development of septic foci is not a matter of chance but under the experimental conditions adopted is practically certain. The addition to the diet of a sufficient quantity of vitamin A in the form of cabbage, butter or liver fat just as certainly prevents the development of septic foci. Again, if animals with infective lesions, except when they are moribund, are given an abundant supply of vitamin A, rapid recovery and cure result. I cannot dwell on the experimental side of this work, but two further facts may be stated. The first is that the anti-infective action can also be produced by carotene, a highly unsaturated hydrocarbon, which forms the pigment of carrots and is also present in green vegetables. The following table summarises this action of carotene and shows it to be almost quantitative in character from the point of view of raising the resistance of animals to autogenous infection.

SUMMARY OF RESULTS SHOWING DEGREE OF
ANTI-INFECTIVE ACTION OF GRADED DOSES OF CAROTENE.

Protective agent.	No. of animals in group.	Severe infection.	Moderate infection.	No infection.	Per cent. free from infection.
None	10	9	1	0	0
0.005 mgrms. carotene	9	6	3	0	0
0.010 " "	8	0	6	2	25
0.020 " "	6	1	0	5	82
0.040 " "	9	0	1	8	89
0.080 " "	4	0	0	4	100
0.160 " "	9	0	0	9	100
0.500 grms. dried cabbage	12	0	0	12	100

The second fact I wish to mention is more closely associated with the problem we are to discuss to-day. If rats, when pregnant, are put on to diets complete except for vitamin A, a large proportion of them develop abscesses in the uterus and fallopian tubes—in fact, develop puerperal sepsis.

It is obvious, then, that we have here facts which form at least a starting point for future research into sepsis and the resistance to sepsis. Before describing the investigations on human beings, let us consider for a moment whether on a priori grounds these experimental facts might be expected to have any bearing on puerperal sepsis in women.

The duty of the maternal organism during pregnancy is to supply all the substances necessary for the growth of the embryo. These substances she

either gets directly from her own food, or synthesises them from her foodstuffs, or supplies them from her own body tissues. Many substances cannot be synthesised by the body and must, therefore, come directly from her food or from her depots replenished by food. Now the body has a great capacity for storing vitamin A, especially in the liver. For instance, the liver of an ox fed entirely on pasture may be extremely rich in this substance. On the other hand, if there is little or none in the food, the liver becomes denuded of its vitamin A store. Most foods do not contain any vitamin A or carotene; for instance, the majority of cereals, including bread, rice, oatmeal, barley, have little or none; lean meat, white fish and poultry have practically none; most margarines, pulses, jam, tea and coffee and fruits have very little or none. It is clear that the foodstuffs most commonly eaten contain very little vitamin A. The chief foodstuffs rich in this substance are green vegetables, carrots, liver, milk, butter, a few special margarines, cheese and fat fish. It seems certain, therefore, that a large part of the population of this country must have small reserves of this vitamin. In pregnancy, matters are worse, for the pregnant woman has to pass on her reserves to the foetus, and the liver of a new born child under good maternal conditions is very rich in vitamin A. It would be expected, therefore, that many women at childbirth would be drained of most of their reserves of vitamin A and, if the animal experiments have any meaning in terms of man, they would have little or no resistance to the invasion of pathogenic organisms.

Green and I determined to test this hypothesis and to this end we initiated two investigations, neither large, and both for many reasons difficult. The first of these was an attempt to see whether we could prevent puerperal sepsis by giving a number of women a rich supply of vitamin A towards the end of pregnancy. The second was to test the therapeutic effect of vitamin A in women suffering from puerperal septicæmia. Work on the prophylactic action of vitamin A against puerperal sepsis has now continued for two years and, although incomplete, I shall describe later our results up to date. The animal experiments on infection gave us good reason for expecting a favourable result from this investigation, for we were testing the power of vitamin A to prevent the local breakdown of resistance to infection in women at an epithelial surface, an action already established as holding good in animals. We were not so optimistic about the investigation into the therapeutic or curative effect of vitamin A in puerperal septicæmia, because this is really a different problem and one for which we had no certain experimental basis. As a therapeutic agent in septicæmia we were testing the action of vitamin A as a means of raising the whole resistance of the cells of the body against pathogenic organisms which had invaded the bloodstream. Having stated the problems and the basis for the investigations, I shall briefly describe the work itself and the results obtained therefrom.

Vitamin A as a Therapeutic Agent in Puerperal Septicæmia.

Puerperal septicæmia is one of the most deadly diseases. The mortality is usually considered to be about 80 per cent., but this may be higher or lower according to the institution, the period of the year and other factors. In the

two years prior to the present investigation 22 cases of puerperal septicæmia were admitted to the hospital in question, and of these 20 died, giving a mortality of 92 per cent.

In the past 18 months we have treated 18 consecutive cases of this disease. Only patients from whose blood bacteria were grown were included in the investigation, the bacteriological examination being made by the same technique and by the same person as in the previous 22 cases, which may be regarded as a control series.

The treatment of the 18 cases has consisted essentially of feeding the patients on diets rich in vitamin A and of administering preparations very rich in this substance. Preparation X contained about 20 times as much vitamin A as cod-liver oil and preparation Y about 60 to 120 times the amount. The following results have been obtained.

VITAMIN A TREATED CASES.

Organisms grown from blood.	No. of cases.	No. of deaths.	Mortality rate.
<i>Streptococcus hæmolyticus</i>	14	4	29%
<i>Bact. Coli</i>	2	0	
<i>Staphylococcus</i>	2	1	
Total	18	5	28%

It is impossible to discuss here the full significance of these results. They are too few in number to give definite proof, and it is impossible to use the non-treated cases as a certain control because they may have been, and probably were, in some cases at least, more severe in type. The results seem, however, to indicate that an increased resistance to the septicæmia condition has been conferred by the vitamin A treatment.

This kind of investigation demands much further attention than it has so far received. The treatment certainly has limitations and seems useless as at present used in the fulminating type of case which comes into hospital and dies within a day or two of admission; and also in cases complicated by general peritonitis and probably in cases with septic thrombo-phlebitis. Cases of puerperal septicæmia without these complications treated early in the disease appear to us to do very well under the treatment. With further experience and greater knowledge of the mode of action of the therapeutic agent, better results still will undoubtedly be obtained.

The Prophylactic Action of Vitamin A against Puerperal Sepsis.

In this investigation Green and I have had the assistance of Dr. Doris Pindar, who has carried out the work in the Ante-natal Department of the Jessop Hospital, Sheffield.

The method adopted was to give alternate women attending the hospital in the out-patient department a small bottle of preparation X, with the instructions to take a half teaspoonful daily. Some of the cases were given the preparation

for a fortnight, but most of them for a month before parturition was expected. We had no means, however, of knowing whether the patients took the vitamin A preparation, and, as it was an oily mixture, it was undoubtedly in some cases disregarded. A corresponding number were left untreated and used as controls. No special instructions as to diet were given to any patient. Vitamin A therapy was stopped on admission to hospital and the staff of the hospital who were attending to the welfare of the patients had no knowledge as to which of them had had the prophylactic preparation of vitamin A. After discharge of the patients from hospital, the notes were collected and records made of any sepsis which developed in the puerperium.

Up to date we have analysed the results obtained in 320 women, 160 who should have taken the vitamin A preparation and 160 cases without this substance.

Taking as a standard of morbidity that of the British Medical Association, which includes all cases in which the temperature reaches 100° F. on any two of the bi-daily readings from the end of the first day to the end of the eighth day after delivery, the total morbidity rate of the 320 cases is 4.4 per cent., an incidence which is decidedly lower than that of 12 per cent. in unselected cases given by most observers using the same standard. Even the control group has only 7.8 per cent. morbidity, a fact which testifies to the value of ante-natal treatment at this hospital.

An analysis of the results is given in the following table:

Note.—Preparation X is Radiostoleum, supplied by British Drug Houses, Ltd.
Preparation Y was supplied by Lever Brothers, Limited.

TABLE V.

PROPHYLACTIC INVESTIGATIONS WITH VITAMIN A IN PUERPERAL SEPSIS.

	Vitamin A Group.		Control Group.	
No.		160		160
Primiparae	(48%)	76	(47%)	75
Cases morbid	(1.3%)	2	(7.8%)	12
(B.M.A. standard)	Both following manual rotation for posterior position. Mitral Stenosis in one		Cystitis-Bact. coli Staphylococcus Bacilluria-Streptococcus Acute Mastitis Septic Endometritis Acute Bronchitis Septicæmia	4 1 1 2 2 1 1
Cases having a rise of temperature to 99° F. or above on one or more occasions after 1st day of puerperium until discharge from hospital. (Not inclusive of B.M.A. morbid cases.)	(22%)	35	(34%)	55
	Cystitis (Bact. coli)	5	Cystitis-Bact. coli	2
	Endometritis	3	Staphylococcus	1
	Acute mastitis	2	Endometritis	1
			Acute Mastitis	2
			Urinary infection	1
			Sapraemia	1
			Streptococcal Cervicitis	1
			Influenza	1
			Septic perineum	2
			Pulmonary embolus	1
Maternal mortality		0	Septicæmia (Haem. Strep.)	1

The points to be noticed about these results are:

- (1) There are an equal number of primiparæ in the two groups.
- (2) The number of complications of childbirth is fairly comparable in the two groups. (Complications of labour are not enumerated in above Table V.)
- (3) The sepsis as represented by the morbidity (B.M.A.) figures in the vitamin A group is 1.3 per cent., control group 7.8 per cent.
- (4) The two cases of sepsis in the vitamin A group were slightly and quickly recovered and followed manual rotation. In the uncomplicated cases of the vitamin A group there was *no sepsis*. On the other hand, nine cases of sepsis in the control group developed in straightforward, uncomplicated cases.
- (5) In the milder degrees of pyrexia, although the difference in the two groups is not so great, 22 per cent. vitamin A group and 34 per cent. control group, the results are still definitely in favour of the former.
- (6) There was only one maternal death in the 320 cases: this occurred in the control group and followed puerperal septicæmia.

Although this does not represent a full analysis of the two groups, it may be said that, however the results are examined, the amount and severity of sepsis were decidedly smaller in the vitamin A group.

I must repeat that we realise our cases are too few to establish complete proof of the anti-infective action of vitamin A in puerperal sepsis. So far as they go, however, they are definitely in favour of this action and bear out the experimental work. We are confident that even better results would be obtained in an investigation carried out more carefully by those with better opportunities for such work than we have, especially if care was taken to see that all patients took the preparation given them and that its administration was continued throughout the puerperium.

I have given you a brief account of experimental work and clinical investigations made with the object of testing one aspect of the problem of the part played by diet in controlling the resistance of the body to infection, especially in the puerperium.

No person connected with scientific investigation wishes to adopt the role of advocate. Nevertheless, I say with conviction, firstly, that the problem of puerperal sepsis, and, indeed, of maternal mortality as a whole, demands attention from points of view other than it has previously received, and, secondly, that the line of study which I have attempted to describe has up to the present given results which suggest that it is likely to be extremely profitable.

While it is probable that the story I have unfolded is only a part of the whole problem of the relation of diet to susceptibility to infection, it is, I believe, a fundamental part. Diet does, indeed, alter the resistance to infection and the diet of many people in this country is defective in the way indicated. I would far rather believe that the reason for the fact that whereas the maternal mortality

in England is 5.0 to 5.8 and that of France is only 2.5 and Italy 2.8, is not that doctors and midwives in England are less skilful than those of France and Italy, but that the French and Italians have a better appreciation of the protective value of vegetables and probably of dairy products than the English.

The other great problem of maternal mortality, viz., eclampsia, I do not propose to discuss because I cannot add anything new to the subject. Here, again, however, diet seems to be of significance, for it is generally accepted that the reduction of the protein in the food is beneficial to patients in the pre-eclamptic condition. This fact, together with other reasons, suggests that a dietic study of the problem of eclampsia from the standpoint of recent knowledge of nutrition would also lead to interesting results.

In one other way must diet be regarded as playing a significant part in maternal mortality. A considerable number of complications, and probably no small part of the mortality of childbirth, is to be ascribed to malformation of the pelvis. One of the main advances of nutritional science in the past 12 years is the knowledge that specific dietic factors control the growth of bone, and if in growth these factors are absent from the food, all the bones become relatively soft and malformed. A diet deficient in vitamin D and calcium and rich in cereals produces this malformation, and there is no doubt that defective feeding during the period of growth of girls and young women is an important factor in increasing birth complications and maternal mortality. Whatever doubt there may still be as to the part played by vitamin A in raising the resistance to infective micro-organisms, there is no doubt of the part played by vitamin D in controlling bone growth and calcification, and it ought to be the first duty of all health authorities to see that the rachitic stigma, and therefore the badly formed pelvis, is banished from the country.

At the opening of the session the CHAIRMAN said: Ladies and Gentlemen, I have to begin by saying a few things as to procedure this afternoon. The procedure will be that Professor Mellanby will deliver an address on Maternal Mortality. When that address is over, I shall ask some persons present here to inaugurate a discussion on that address, and then I shall ask those in the audience who desire to say anything on the subject to come to the platform and say what they wish to say, giving their names and the bodies with which they are connected. The address and the remarks will be included in the Proceedings of the Congress which will be published as soon as possible, and speakers will have an opportunity of correcting their remarks before publication. Then, should time admit, I will ask the speaker to conclude by making such observations, if any, as he desires on what has been said on the address. So much for the procedure of the Session.

The subject of the Session is Maternal Mortality, and it should, I think, be called Maternal Mortality and Morbidity, because morbidity has to be remembered very carefully indeed in this connection. It is a subject on which public opinion is deeply stirred. It was handled at large by the Royal Commission on National Health Insurance in 1926. Since that time various schemes have been published for providing what is called a National Maternity Service, with special reference to this problem of maternal mortality and morbidity, and quite lately there has been published a Report of a Committee with a mass of

information on the subject. It is known that the Government have declared their intention of taking action with regard to this question, and, therefore, it would be inappropriate for me, as a Civil Servant, to say anything with regard to the details of the subject, or the policy which ought to be adopted. Therefore I will simply confine myself to saying that it is notorious that in this particular the success which has attended the Public Health organisation generally has not yet been secured, and there is a situation in which the bearing of children is very nearly tending to become a dangerous occupation. Now that is a position which quite clearly requires attention and thought on the part of those of us who are concerned with public health, and the soundness of public health arrangements. So much for the subject.

I have to introduce to you to-day as the speaker Professor Mellanby of Cambridge. It would be presumption on my part to say much with regard to Professor Mellanby. His work, especially on the subject of Dietetics, is well known in this country, and far beyond the confines of this country, and I am sure that the address which he will deliver to-day will be interesting and fruitful. There is one observation that Professor Mellanby asks me to make, and that is this: In his address he will deal primarily with this particular problem with reference to what I may call dietetic, or some dietetic, considerations; but he particularly desires that the scope of the discussion should not be confined to that particular aspect of the problem that he will deal with, but that the discussion should be general on the problem—the remedies and the action that should be taken.

Having said so much, I will not detain you any longer from the pleasure of hearing Professor Mellanby, and I will call upon him to deliver his address.

PROFESSOR MELLANBY then delivered his address.

DISCUSSION.

DAME LOUISE MCILROY: I have listened to Professor Mellanby's Paper with the greatest pleasure; I do not know when I listened to a Paper on Maternal Mortality with so much advantage to myself. You will notice that he attaches no blame to any of the medical professions for the high percentage of maternal mortality and if you read the Government Committee's report carefully you will find that the criticisms are very slight indeed and they take into consideration the enormous difficulties round us in trying to reduce this maternal mortality. You will hear that the doctor is blamed, and the nurse is blamed, and so on, but I do not think the blame can be applied to the profession as a whole, because everyone I come in contact with is trying to reduce maternal mortality.

Dame Louise went on to say that Professor Mellanby had struck a point to which she had devoted a good deal of attention and that was the question of the digestion of the patient and the condition of the intestine. That was the most important point of view. Professor Mellanby had laid stress on two

points, namely, the question of the patient's resistance to disease and the patient's surroundings. Everyone advocated hospital treatment and clean rooms, and if they took the surroundings, they were extraordinarily good, but the surroundings were not the only important factor. In Islington, where the Royal Free Hospital has a Maternity Clinic and where they have worked on maternity work for four years, there has not been a single death among the mothers. In areas in the West End of London women die in childbirth in spite of everything that could be done for them. She had very little faith in anti-septics unless properly applied. The whole point was the care of the patient before the baby was born. It was not the present generation which was going to deal with the question of the contracted pelvis, but the future. The remedy lay with those who inspected the babies in the clinics to see that they were properly fed and that rickets did not occur. If they saw a child hobbling along, as they could see in some industrial towns, they would say it was suffering from rickets, but even if the

child was walking straight it did not follow that it was not rickety. They had to deal with the child and consider its health when it is grown up and producing a baby. Sound teeth and the condition of the regular action of the bowels were of the utmost importance to the expectant mother. Some women's mouths showed that they must swallow a good deal of infection; that was very common among women who led an indoor life; and if there was infection in the intestines it was passed on to the unborn child. There was a popular idea that if you extracted a woman's teeth during pregnancy, she would have a miscarriage. That was perfectly wrong. Seventy per cent. of the cases which came to the Royal Free Hospital are sent to the Dental Department and there has never been one case of miscarriage. Dr. Mellanby had spoken of the research into puerperal sepsis. The report of the Maternal Mortality Committee showed that the deaths from lung conditions were extremely high. In the majority of cases, septic pneumonia is due to septic uterine conditions. The most modern treatment of sepsis was not douching or curetting. There had been a revolution in the treatment and an important item in the treatment is to clear out the infection in the intestines by the daily washing out of the intestines. By washing out the toxins from the intestines, the patient would improve in a great majority of cases. Dr. Mellanby had given a list of various foods which the patients could take, but the question of the cooking of those foods should be looked into. That is where the trouble lies. In France and Germany, more attention is paid to this question than in England. The average Frenchwoman knew how to cook very much better than the average Englishwoman of the working classes. If it is necessary for a pregnant woman to take a certain amount of good food, it must be cooked and served up in a proper manner. Another point upon which great stress should be laid was the drinking of water. There were in this country very few facilities for drinking water. Not long ago she made a visit to Canada and the United States and she was very much impressed with the amount of water drunk, and it had a very marked effect on the people as a whole. If pregnant women could be persuaded to drink a great deal of water, it would flush out the intestines and kidneys and have a great effect in preventing

sepsis. Water should be freely supplied in hotels and restaurants and in public places.

Professor McIlroy concluded her remarks by expressing her admiration for Dr. Mellanby's work and said that it was on these lines that scientists like Dr. Mellanby would get the solution of the problem. She was very grateful for the Paper, and had learned an enormous amount from it.

DR. J. JERVIS (*Medical Officer of Health for the City of Leeds*): Sir Arthur Robinson, Ladies and Gentlemen, I should in the first place like to add my congratulations to Professor Mellanby for his very valuable contribution to this very difficult subject of Maternal Mortality. The profession of Medicine, as well as the community in general, owe a very great debt to Professor Mellanby and his good wife for the many brilliant researches which they have carried out into the practical problems of to-day. What always occurs to one in reading the productions of our scientific institutions is that so much work is done on abstruse subjects which have very little relationship to everyday problems. Professor Mellanby has applied himself to problems of the very first importance regarding our every day life and health, and this is one of them. But in approaching the subject of Maternal Mortality, I find that the further we go into it, the more baffling it becomes. Our knowledge of it is very contradictory indeed. You have just heard Professor McIlroy state that they drink more water in the United States than we do here. Probably because they have no option; it is a case of Hobson's choice. But, nevertheless, the maternal mortality in the United States is much higher than it is in this country—the very opposite to what one would expect if water had anything to do with it. I have some statistics here which I have prepared on the subject. I am not going to weary you with unnecessary statistics, but these figures are very important indeed. They refer to my own City, the City of Leeds, and I think they may be taken as typical of the country as a whole. The City is divided into 17 Wards, and the three Wards with the largest population, and those in which the majority of the slum areas are to be found, strange to say, give us the most favourable statistics so far as maternal mortality is concerned. For example, in 10 years the average maternal mortality for the whole of Leeds is 4.49 per cent., but if we take the three Wards

I have mentioned, we find that the worst of the three has a maximum of 3.01, and the other two 4.17 and 4.06 respectively. Now let us turn to the best Ward of the City, the one which comprises people who live in considerable affluence. It is called the New Ward. We find it has the highest mortality, with the exception of one Ward, which for our purpose need not be taken into account, because it is a Ward composed almost entirely of business houses and only to a small extent residential. This Ward has a mortality of 5.93. Now if we turn to the mortality from sepsis, what do we find? We find that the three Wards I have mentioned have a mortality no higher, indeed, as regards two of them, lower, than the average for the other Wards in the City. The average for the whole City is 1.64, and for those three poor, highly congested Wards, it is 1.39, 0.90 and 1.86 respectively.

As regards deaths of mothers from accidents and diseases of pregnancy other than puerperal sepsis, the mortality rates for these three Wards are 2.78, 2.11 and 2.60 respectively, whereas the rate for the city as a whole is 2.85, whilst the rate for the New Ward is 4.15. The inference one would draw from these figures is that the risk of death during child-birth from causes other than sepsis is very much greater amongst the rich than amongst the poor, and it does not seem likely that the source of this greater risk is to be found in the feeding.

If we look at the birth rate, we find these Wards are at the top of the list, with rates of 26, 23.9 and 22 per thousand respectively as compared with an average of 18.5 for the whole City. Similarly, with regard to the death rate they have the highest general death rate, namely, 17.1, 15.5 and 13.5 per cent. as against 13.7 for the whole City. Then if we consider the infantile mortality rate, precisely the same thing emerges; these three Wards have the highest infantile mortality rate, namely 124, 108 and 99 respectively, as compared with an average of 96 for the whole of the City. So what it comes to is this so far as Leeds is concerned, that the maternal mortality is lowest in the poorest, most congested and least healthy parts, and highest in those areas which are healthy, least congested, and where the standard of living is obviously higher. All these statistics I have given you baffle me very much. I am sure they must baffle all statisticians, and they baffle me more

this afternoon after hearing Professor Mellanby's lecture than ever they did, because we have in those Wards people who do not get the food that Professor Mellanby says they ought to get. They are people living for the most part on cereal food, with a very limited amount of those substances mentioned by Professor Mellanby as necessary to resist puerperal infection. There must be, therefore, some unknown factor. It may be that Professor Mellanby's hypothesis will lead us to that factor, but I cannot agree that in his Paper to-day he has quite proved that deficiency in diet, or unsuitable diet, is the cause of maternal mortality, or in particular of puerperal sepsis, which is one of the main causes of maternal mortality. He was very careful to say that the sample of cases which he had been able to deal with was small, and, of course, as his research proceeds it may be possible that he will be able to strengthen his case and come before us at a future date and explain these apparent contradictions which I have put before you. That maternal mortality is low amongst the very poor is not my experience only. It is, as you have heard, the experience also of Professor McIlroy, and it has been the experience, I think, of Obstetricians all over the country. Therefore there must be some other factor at work. Professor Mellanby has mentioned the French and Italians as having a lower maternal mortality than we have because they are more careful in the selection of their diet, and I have got out some special figures for the Jewish community in Leeds, which as you know lives very much like the Southern European people. What do I find? I find that the maternal mortality among the Jews is higher than for the City generally, namely, 5.29 and 5.01 for the years 1928 and 1929 respectively. I have not been able to get statistics for ten years. Here, then, is another proof that there is some factor, perhaps an avoidable factor, which has not yet been revealed and which may possibly be dietetic in origin. I hope that as Professor Mellanby elaborates his thesis he will be able to reveal that factor, because I am perfectly sure of this, that it has nothing to do with the skill of the doctor or the midwife. We have better trained doctors and midwives at work in this country to-day than ever we had. There is no doubt about that. It cannot be due to lack of knowledge, because the people of this country surely do know something

to-day about pregnancy and child-birth. If they do not, their ignorance must be laid at their own doors, because publicity on the matter has been wide-spread. There is the ante-natal clinic. Not only does it yield advice to the young mother, but in many cases it also provides her with food in order to help her to resist disease and to produce a healthy living child. Therefore, as I have said, we must look elsewhere for this unknown factor, and I hope that Professor Mellanby will continue his researches because they may lead in the end towards the disclosure of that factor. I want to thank him again very heartily for the paper he has given us this afternoon, and also to wish him success in his further researches.

THE CHAIRMAN: I will call upon Sir Arthur Newsholme, late Principal Medical Officer of the Local Government Board.

SIR ARTHUR NEWSHOLME: We are grateful to Professor Mellanby for reading this paper, for he has opened up a new line of action which even if it did not do all that appeared to be promised, could do no harm. If by consuming the active principle of carrots and similar vegetables one can diminish the risk of septicaemia, let it be done in every case. It is evident that Professor Mellanby's investigations on lower animals have shown that sepsis can be reduced by these means, and the power of resistance to germs can be raised. There is therefore a strong case for supporting it in that alone, though we cannot be too sanguine and assume that similar results will follow for human beings.

Apart from their present contribution, Professor and Mrs. Mellanby have done a great deal in the past to diminish maternal mortality. They discovered the fundamental means of preventing rickets, and if their advice as to cod liver oil is carried out there need be no rickets in this country; it could be annihilated altogether, and thus a great cause of maternal mortality through the pelvic deformity produced by rickets would be removed. For a large part of puerperal mortality preventive measures must begin with the baby, 25 years earlier. In his present investigation Professor Mellanby set out on the assumption that puerperal mortality has not declined. It would be a most remarkable and incomprehensible thing if there had been no improvement, in view of the great efforts that have been made; and yet the figures quoted by him seem to show a fairly constant mortality. This is a case

in which the crude figures must be assessed in the light of a collateral knowledge. The figures issued by the Registrar General need to be interpreted in the light of three facts. Firstly, doctors are more completely accurate in certifying than in the past. Secondly, there are smaller families, and there are more first babies than subsequent babies. The risk of danger in child-birth is double with the first baby than with subsequent babies. Thirdly, there is the strongest reason to believe that in modern days with birth control so prevalent, that when measures to this end do not succeed there is much practice of abortion, and it is highly probable that abortion is much more common than it formerly was. In abortion the risks are greater than they are in child-birth. So that there are three factors, all of them outside the influence of the practice of midwifery by midwives and doctors. Had there been no improvement in midwifery practice, the figures of puerperal mortality ought to be much higher now than in the past, whereas they are stationary. The stationary position means considerable improvement. But although there has been this improvement, I agree with Professor Mellanby that the present puerperal mortality should be reduced by one half, and one of the methods undoubtedly is by means of improving the hygiene of pregnancy, including the specifically better food emphasised by Professor Mellanby and undoubtedly much improvement could be secured in that direction.

My main point in rising was merely to press the point that we need not be unduly pessimistic in this matter. There has been improvement, and we can have further improvement if we only pursue our way in well doing.

THE CHAIRMAN: Will anybody who desires to continue the discussion kindly come to the table and announce his name and the authority he represents. The next speaker is Dr. Fairer, the County Medical Officer of Health for Leicestershire.

DR. J. A. FAIRER (*County Medical Officer of Health, Leicestershire*) stated: I am heartily in agreement with Prof. McIlroy about the need for better cooking in the homes of England.

I also agree with the Medical Officer of Health for Leeds that maternal deaths are less prevalent in the populous over-crowded areas. In such areas there are large families with a relatively high rate of infantile

mortality, but there still remains the astonishing fact that the rate there for maternal mortality is comparatively low. As the result of statistical information it is clearly proved that maternal mortality is highest among the well-to-do people. While admitting this fact I think we have to admit that these well-to-do people can afford to get the best medical attention and will see that they get it. We have admitted that the scientific knowledge of the doctors and midwives is better than previously and yet we are still faced with this high rate of maternal mortality. Therefore should we not look for the cause of the trouble in the women themselves? I ask the pertinent question, have the women altered? Have the recent dictates of fashion anything to do with the untoward results arising from maternity? Particularly among these dictates I refer to the present craze for slimming and I do consider that this factor is of considerable importance in relation to the troubles and difficulties experienced in labour by our modern women. Examples of this are not hard to find. The modern girl with her keen indulgence in sport and her efforts to produce by exercises a slim figure and narrow pelvis forms the typical example of what I mean. Is it possible that this creation of modern times has anything to do with the difficulties with which we are now contending?

Go another step further. Ante-natal clinics are going to help us; I quite admit that, but in my day we were not taught ante-natal work, and I think there are other doctors in my County who have not been taught. They are older than I am, and we were not taught ante-natal work. I think the younger medical men who have been taught ante-natal work in the hospitals will help to lessen this maternal mortality. Personally I undertook recently a six months' post-graduate course, and this I would fully recommend to all medical men interested in maternity work.

I consider that ante-natal work will in time make a profound difference in the statistics of maternal mortality. It is not too much to hope that arising out of this work there will come about a progressive reduction in the rate of maternal deaths. In this respect, however, I have one criticism to add. The Ministry of Health have issued a memorandum with regard to ante-natal work. I consider that this memorandum with the instructions which it embodies is far too detailed and extensive for

practical use. The circular states that the mother should be examined at the end of the 16th week and then every month for so many months and then every fortnight, and later every week, and the examination is to be complete and detailed on at least three occasions. I rather fear that such concentrated and continued effort will lead to some degree of apprehension on the part of young mothers, and I really consider that the number of examinations and their nature are in excess of what is really required to ensure the safety of the woman. The question of maternal mortality is one which presents so many difficulties that I am willing to entertain and consider any suggestion whatsoever which may prove to help in dealing with the situation.

PROFESSOR MELLANBY: It is quite clear that the type of investigation I have described and the results obtained are difficult to criticise because of their newness, so that there is probably little further to be said on this part of the subject to-day. Some of the speakers have, however, raised points in the discussion upon which I should like to say a few words.

Dame Louise McIlroy deprecated the fact that so much blame was being laid on doctors for many of the mishaps of pregnancy and parturition. I agree with her that this critical attitude is largely unjust. As already explained, I believe that in many cases of childbirth there is little or no margin of safety and it is these border cases which tend to succumb. My whole object in opening this discussion was to suggest one method of increasing this margin of safety. If we could only find out why so many women are potential sufferers from sepsis and eclampsia, we could tackle the problem by means of prophylaxis and so increase the margin of safety before the doctor and midwife are called upon to assist at parturition.

It is unfortunate that one of the results of the National Mortality Interim Report has been to convey to the minds of some people that deficient skill in doctors and midwives is the kernel of the trouble. That some such impression is conveyed appears evident, for, as recorded by the Press, whenever the Minister of Health thinks of the subject of maternal mortality, his blood "begins to boil." This emotional reaction seems to me to indicate a sense of accusation against doctors and midwives for their lack of skill. The cause of the trouble is, I believe, really

much more fundamental and consists primarily of our general ignorance of the physiology and pathology of pregnancy and childbirth.

Dr. Jervis's contribution to the discussion was also important. He told us that in Leeds the highest maternal mortality was found in those parts of the town where the standard of living was best. This appears at first sight a serious criticism against the hypothesis I have advanced to-day, because obviously the better class woman can more often afford to buy foods containing vitamin A since most such foods, which include butter, eggs, milk and green vegetables, are costly. I regret that I cannot at the moment see what answer to give Dr. Jervis which would be satisfactory to the hypothesis I have placed before you. I am not, however, depressed by the facts as stated for in new work it frequently happens that disconcerting situations arise and only clear up on further consideration of the problem. When, for instance, my wife first published her work on the dietetic control of the structure of teeth and I published my work on rickets, we were faced with a similar problem when it was pointed out that the best teeth, the least rickets and the lowest infant mortality in the British Isles, and probably in the world, were to be found among the inhabitants of Lewes and the Western Hebrides, and yet these people were living on the verge of poverty and under conditions of very bad hygiene. A close study of the dietary of these people immediately shed light on the general problem and brought the facts into line with the experimental data we had described. So, I imagine and hope, will the facts adduced by Dr. Jervis be readily explained by more careful study of the diet and other conditions of the Leeds mothers.

That diet is the crux of the problem is to my mind undoubted. Whether you can persuade the people that their general health could be made infinitely better by making use of new knowledge of dietetics is a point which I must leave to others. There is no subject in medical science that has made so much progress during the past twelve years as that of diet and nutrition. This knowledge has made little impression on the general public, for even those who are prepared to believe have little chance of obtaining reliable information. Advertisements and articles in the Press are generally bewildering and often untrue. Official reports usually content themselves by suggesting the benefits of "good

food" or a balanced diet. This is of little more value than suggesting to a chronic alcoholic that to improve his state of health he needs a "good drink." Nutrition is tending in some respects to become an exact science. When you consider that probably only 1 or 2 milligrammes of irradiated ergosterol daily are sufficient to ensure perfect formation of teeth and bones and 5 to 10 milligrammes of carotene daily have a great effect in raising the resistance of the body to infection, you will realise that more specific instructions as to diet ought to replace the advice of taking "good food."

The remarks of Sir Arthur Newsholme are most significant. I understand from him that the official figures of maternal mortality are to some extent misleading, for with the introduction of smaller families there are a larger number of primiparae to-day and that since primiparae are more susceptible to mishaps in pregnancy and parturition, there has really been some improvement in the general situation not reflected in the maternal mortality figures. This fact must bring some consolation to those responsible for the great improvement during recent years in facilities of childbirth but, even so, nobody can rest content with the 5 per thousand mortality rate as found at present.

The next problem raised was the effect of exercise on the maternal health and susceptibility to disease. About this I know nothing. I think, however, the working women of Lancashire might be regarded as taking much exercise, but I believe the maternal mortality among them is very high.

A delegate suggested that the explanation of the figures given by Dr. Jervis relating to the higher maternal mortality in the better class districts in Leeds is probably due to the fact that there are a greater proportion of primiparae among these women than in the poorer districts and that the increased susceptibility of primiparae as compared with multiparae to disease at these times may explain the discrepancy.

THE CHAIRMAN: I should like to close the Conference by proposing a vote of thanks to Professor Mellanby for his address. What he suggests is that here there is another line by reference to which we can tackle the problem of maternal mortality and morbidity—here is something that does give us *prima facie* a ground for further inquiry and further

research. That, it seems to me, he has demonstrated as a perfectly sound line to take. In substance he tells us that we have not carried out in our food arrangements the results of modern research in food. In 1928 when I was here there was a special address on that point, and everybody agreed that we were up against something which was difficult to move, and that is the general conservatism of the people of this country, and that what you had to do was to develop knowledge of the sounder kinds of food and the method of preparing the food—cooking the food, and so on. Somebody has been rather criticising the Ministry of Health to-day. I may, however,

say that this particular question of how to bring knowledge of food values into the homes of the people is engaging the attention of the Ministry, and we hope soon to make further arrangements for progress in that respect.

I should like on your behalf to propose a very cordial vote of thanks to Professor Mellanby. I think he has given us novel and interesting information which it is worth our while to ponder. What he has done is to give a very useful indication of one way of further progress in grappling with this very trying and very difficult question.

(A vote of thanks to the Chairman was passed, and the proceedings terminated.)

PUBLIC HEALTH CONGRESS (1930).

THURSDAY, NOVEMBER 20th

(MORNING SESSION).

CHAIRMAN: L. G. BROCK, Esq., C.B.

(Chairman of the Board of Control)

Some Practical Aspects of the Mental Health Problem.

AN ADDRESS BY

T. BEATON, Esq., O.B.E., M.D., F.R.C.P.

(Medical Superintendent of the City Mental Hospital, Portsmouth).

IN comparison with other branches of the Public Health Services, the matter of the mental health of the community is not one which has, to say the least, obtruded itself in the past. Old traditions die hard and in no department of medical work has the struggle to obtain a proper understanding and sympathetic hearing from both professional and lay authorities, been more uphill and difficult. The treatment of the mental patient has necessarily been a matter apart. The legal problems involved have been governed by special Acts of Parliament, which, mainly directed towards preserving the liberty of the subject on the one hand and the safety of the community on the other, have very definitely limited any possibility of action towards the benefit of the individual himself or the community at large.

It is not a matter for surprise, then, that while the public health service has developed so rapidly in other directions, in regard to mental disorder, practically the same state of affairs still exists to-day as when the Lunacy Act of 1890 came into force.

If any excuse were needed for bringing the subject of mental disease before the attention of a Public Health Conference, quite apart from the magnitude and the urgency of the problem, it is that recent legislation—the Local Government Act of 1929 and the Mental Treatment Act of 1930—have opened up possibilities which were purely idealistic heretofore. It is much to be hoped that the public in general and local authorities in particular can be awakened to realise the